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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/611,589	06/30/2003	B. Michelle Chen	AMAT/1717.D2/CPES/DT/PJS	5241

7590

04/25/2006

Patent Counsel
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EXAMINER

WYSZOMIERSKI, GEORGE P

ART UNIT

PAPER NUMBER

1742

DATE MAILED: 04/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/611,589

Applicant(s)

CHEN ET AL.

Examiner

George P. Wyszomierski

Art Unit

1742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 3/22/06 (RCE).
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☒ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,5-9,11-14 and 21-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,5-9,11-14, and 21-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

1. The Request for Continued Examination (RCE) filed March 22, 2006 (with Certificate of Mailing March 20, 2006) is considered proper. The Amendment filed February 21, 2006 has been entered. Prosecution continues as follows.

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 5-9, 11-14, and 21-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Sandhu et al. Advanced Metallization Conference reference in view of Kitazawa et al. (U.S. patent 6,178,623).

Sandhu discloses electroplating copper on a substrate followed by heat treating for 5 minutes in an atmosphere comprising nitrogen and hydrogen at a temperature of, e.g. 200 or 250 degrees C (see Figures 5 and 6 of Sandhu). With respect to the "first chamber" and "second chamber" limitations, it appears that Sandhu performs the annealing in a "Blue M inert gas oven" (see page 211 of Sandhu), which would be a chamber distinct from that in which the electroplating of Sandhu is performed.

Sandhu does not disclose rinsing prior to heat treating, does not specify bringing the substrate in proximity to a cooling plate to cool the substrate to a certain temperature as now claimed, does not specify a hydrogen content less than 4% as in instant claim 4, does not specify treating in an environment of less than 100 ppm oxygen as required by instant claims 8 and 13, and does not specify a pressure of 760 torr as required by claims 9 and 14. These

differences are not seen as resulting in a patentable distinction between the prior art and the claimed invention because:

a) Kitazawa, particularly column 11, lines 23-26 therein, indicates it was conventional in the art, at the time of the invention, to rinse an electroplated copper layer prior to heat treatment in an inert atmosphere such as a nitrogen atmosphere.

b) The temperatures to which the substrate is cooled in the instant claims, and at which the cooling plate is maintained in claims 23 and 26, include room temperature. The examiner's position is that any industrial process that involves heated material, such as those described by Sandhu, would include a final step of cooling the heated material to room temperature. Any apparatus involved in this step would be "maintained" at this temperature by virtue of its being exposed to ambient air.

c) Sandhu performs annealing both in a substantially nitrogen atmosphere and in a 95% nitrogen-5% hydrogen atmosphere; see Figure 5 of Sandhu and its accompanying text. Thus, the use of an atmosphere between these two particular embodiments, e.g. one with less than 4% hydrogen, would fall within the purview of Sandhu.

d) With respect to oxygen, page 211 of Sandhu emphasizes that the copper in the prior art readily reacts with oxygen and therefore it is important to anneal in a controlled, inert environment. Thus, use of a severely limited amount of oxygen as presently claimed would have been obvious from the Sandhu disclosure.

e) Sandhu page 213 indicates that the oven used for heat treating in the prior art was not leak tight and operates only at 0.5 psi (26 torr) higher than atmospheric pressure (760 torr). This difference of approximately 3.4% in the pressure between the prior art and the claimed invention is held to be of no patentable moment.

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Consequently, the combined disclosure of Sandhu et al. together with that of Kitazawa et al. would have rendered the claimed invention obvious to one of ordinary skill in the art.

4. The terminal disclaimer filed on February 21, 2006 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of any patent issued on Application no. 10/074,353 has been reviewed and is accepted. The terminal disclaimer has been recorded.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to George Wyszomierski whose telephone number is (571) 272-1252. The examiner can normally be reached on Monday thru Friday from 8:00 a.m. to 4:30 p.m. Eastern time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King, can be reached on (571) 272-1244. All patent application related correspondence transmitted by facsimile must be directed to the new central facsimile number, (571)-273-8300. This new Central FAX Number is the result of relocating the Central FAX server to the Office's Alexandria, Virginia campus.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


GEORGE WYSZOMIERSKI
PRIMARY EXAMINER
GROUP 1742

GPW
April 24, 2006